NRC Panel: NCA Review
25-26 July 2012

The focus of the review was issues related to development of the 2013 NCA draft report as well as development of the sustained assessment process. The panel noted the progress of the NCA to date in establishing a framework and developing a draft report. The sustained assessment process was also noted for its ability to contribute scientific syntheses, support decision making on multiple scales, engage partners across sectors, increase public participation, and leverage related scientific and engagement efforts.

NCA requested input from the panel both on "**process**" topics, about developing and nurturing a sustained assessment, and on "**product**" topics encountered in development of the 2013 report.

PROCESS #1: *Criteria to guide the selection of topics for interim NCA products (between the 2013 Report and the 2017 Report), including both "foundational" documents and "topical" documents.*

Criteria suggested by the panel included:
- Emerging major changes in scientific understanding;
- Topics that are salient and credible in the next 4 years to specific categories of decision makers and other audiences;
- Valuation case studies to demonstrate the costs of impacts and the value of socioeconomic research;
- Topics that would be useful to build trust in the process among key groups;
- Information needed to increase the capacity of decision-makers to plan, such as scenarios;
- Information that would be useful to improve the next NCA, such as:
    1) International global/climate change impacts on the US,
    2) Methods for regional near-term (2-10 year) projections
    3) Information gaps that can be filled
    4) Integration of topics – e.g., describe impacts in a region and their interaction.

It was also suggested that the interim reports should generally be somewhat limited in number in order to emphasize the importance of the topics.

PROCESS #2: *Addressing the challenges of detection and attribution of climate impacts, including 'human system' factors (e.g., the idea that some impacts could be masked by adaptation responses).*

The panel agreed that an interim report on US-focused attribution would be useful. The degree to which vulnerabilities are due to changes in human patterns (e.g., settlement, water supplies), is also related to the question of attribution and should be explored. The intersection of attribution and risk is also a good topic, for which the combination of storm surges and sea level is an example. Because attribution of single events is difficult, it was suggested that the focus instead should be on identifying the right methods to calculate the risks to human well-being as a function of climate change and social change.

PROCESS #3: *Components of scenarios that should be further developed in the next few years (e.g., regional demographics; consistency with global scenarios, etc.).*

The panel had discussed, during the preceding USGCRP NRC Committee meeting (on how to incorporate Social, Behavioral and Economic sciences into the USGCRP program) suggestions for socioeconomic and behavioral indicators. In addition, the panel discussed the possibility of scenarios being designed to illustrate the effect of regulations, and the need for more detail and consistency in future land use/land change scenarios and use of CMIP5 data.

PROCESS #4: *Approaches for selecting NCA indicators, incorporating physical, social, and ecological factors into informative metrics.*

The NCA has been collecting and referencing previous work on indicators to plan the broad national NCA indicator system. The Global Change Information System is being designed, in part, around indicators as an organizing principle. Input from the NRC was requested specifically on development of social indicators such as vulnerability and adaptive capacity. The panel was enthusiastic about the work done on indicators thus far, led by Melissa Kenney, and recommended that next steps include convening an expert panel to determine the purposes that the indicators should serve, and then proposing a candidate set of indicators.

The results of the 2010 NRC report on indicators for national security, which included social and economic indicators for sustainability, might be useful to the NCA. There are also many rapid Arctic changes such as sea ice and snow cover that would benefit from indicator development. The panel suggested that the positive and normative dimensions of indicators must be considered to ensure that the indicators are really tracking items that are useful for decision-making. There is also a need to have a structured conversation about balancing indicator utility with perfection. For example, social vulnerability indices aren't perfect, but they are used widely and are good for comparisons. The NCA should consider ways to set up a process to develop increasingly valid and useful indicators over time. Any aggregate indicators, which necessarily contain implicit weights, must be carefully chosen and the weights must be transparent. Finally, to understand present and future issues, indicators must have the possibility of being predictable by climate models, in order to connect the past to future projections.

PROCESS #5: *Contributions of the sustained assessment process to vulnerability assessments.*

A lot of work is already being done on vulnerability assessments in real decisions, so the question for the future is how the NCA can support these types of decisions. A number of snapshots of vulnerability exist, but it would be useful to develop a process for upgrading maps and assessments in interim years. Continuing to collect and organize information on adaptive capacity and vulnerability will also be useful. Vulnerability assessments could also be expanded by collaboration with the engineering community, which has a deep familiarity with the types of vulnerability analyses that are already being done for extreme events (who, what types of events, where). As different sets of indicators are created for different vulnerabilities, it will be useful to establish best practices (packaged by region and by sector) for engineers (who have a lot of influence on decisions, especially regarding the built environment).

Sometimes we think too much about providing more information instead of more authoritative information, and with vulnerability assessments the focus really needs to be on authoritative, reliable information.

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PRODUCT #1: *Utilization of historical base periods.*

The complex issues of temperature changes can be difficult to describe to a non-technical audience. The panel suggested that perhaps there should be different baselines or reference time periods for different constituencies, considering the purpose that the answer will serve (e.g., dam construction or seasonal planting), so that users could help define the baseline. In general, base periods should be as long as possible, provided that good meteorological data is available. The links to data used by the NCA (which will be provided in the final report) will allow users to directly access the underlying information, which will support any brief statements that are made about temperature changes. The goal is to describe, in simple terms, the concept that the probability distribution has changed over time. Describing cumulative probabilities, such as number of days over 90 degrees, might be one method to give information about temperature probability distribution in a simple way that people can relate to.

PRODUCT #2: *Frameworks in which to describe that climate impacts occur within a context of multiple stressors; inter-sectoral and inter-regional effects are a significant concern, and some drivers, responses, and impacts need to be considered in an international context and within a spatial hierarchy.*

The panel discussed many possibilities for using stories or case studies as a supplemental way to communicate the complexities of contexts, scales, and multiple stressors. The use of case studies is very well established and could be a good model for the NCA. Stories could be included for individuals, communities, industries, etc., provided that they are scientifically sound and that the process of selecting the stories is documented. The specificity of a real story is compelling, but stories need to be balanced, unbiased, and show multiple angles in order to avoid the appearance of selection of a single point in a complex probability distribution. Stories would function well as illustrative examples, but must not be used to lead readers to broader conclusions. As a further note, the panel discussed that inclusion of stories may introduce the subjects to public scrutiny. Therefore, NCA must have very clear communication with any highlighted individuals or organizations about possible outcomes of their inclusion. It was suggested the standard research requirements for "human subjects" be considered.

Diagrams were also suggested to assist in illustration of complex concepts. There was also a recommendation to make report graphics available in simple downloadable formats (e.g. powerpoint) so they can be easily downloaded and used by others.

PRODUCT #3: *Minimizing risk: describing decisions at all scales and their interactions in reducing or exacerbating climate risk.*

No specific comments were made. Discussion on previous questions is applicable to this issue.

PRODUCT #4: *Emissions: representing the value of different levels of emissions reductions.*

The primary issue here is that the carbon cycle, with all its sinks and flows, is a complex concept. Diagrams will be necessary, but it will be important to describe emissions and impacts in human terms. Visualizations at different scales could help with understanding of the impacts of/on human lifestyles or different emissions futures – but the illustrations must be representative and scientifically valid.

Also, there is a need to disclose information about the effectiveness of different scales of action: emission reductions of all scales are useful, but the effectiveness of individual efforts compared to global mitigation programs should be stated.

PRODUCT #5: *Describing the links between drought and climate.*

The panel noted that there is a difference between trends that can be predicted with confidence, and things that people are concerned about today, such as specific droughts in particular places. It is difficult to decouple the attribution and prediction components of drought. We understand drought fundamentally, but we don't have enough data points on past events to state conclusions on climate linkages – i.e., we have had serious droughts in the past, but we didn't previously have soil moisture measurements, and today's droughts are hotter than past droughts, likely having more impacts under the same precipitation regime. One possibility on this topic is to describe the spread and depth of information in the scientific literature.

Several notes were made about historical drought events in the U.S., such as the 1930's drought, an event of enormous impact that spurred policy action on farms and social change. Donald Worster has written extensively on the history of drought in the U.S. and a link to his work was provided to staff.

PRODUCT#6: *Explanation of costs of impacts, the costs of inaction, and/or the benefits of adaptation.*

The panel asked about the utility of insurance statistics in evaluating economic impacts, and Lindene Patton, a NCADAC Executive Secretariat member in attendance, was invited to speak. Most of the insurance costs associated with climate change are hidden, because they are for specific, unattributed events. The insurance industry only has loss data to the extent it is insured; many losses are uninsured, and most costs that are insured are not tracked as climate change losses. At best, the insurance industry will underrepresent the economic impacts of climate change. However, the industry has models for impacts based on retrospective data and even the lower bounds of estimates could be important motivators for planning.

There is time scale dependence to costs, as well. Data exist for short-term events, but people will adapt to longer trends (with or without adaptation info), thereby reducing the costs of impacts over time. In

considering economic impacts, there is a great need for research to look at linkages and full costs, not just the primary impact. For example, costs are spread over the whole society when crops are affected.

While there are not yet comprehensive economic analyses over consistent time scales, we do have specific analyses for certain places and/or times. Few data exist on economic benefits, but there are some examples of economic costs, and examples can also be given for ways people have addressed adaptation.

Overall, the panel agreed that the NCA absolutely must include economic information, regardless of whether consistent, nationwide data are available. Specific studies can be referenced and discussed, as long as their treatment in the report is transparent and consistent. A consistent set of assumptions about economic growth or discount rates should be selected for use throughout the report.

PRODUCT #7 *Scales of impacts: any given climate driver can lead to wide ranges of impacts, with different intensities, felt at multiple scales (including that impacts may be negative in some contexts and positive in others, or extreme in some contexts and modest in others).*

There is great public awareness that there are regional differences in weather and climate, so uncertainty of weather (variability) plus uncertainty of the climate trend could be a good way to explain the scale of impacts. Maps could be used to illustrate the diversity and intensity of expected impacts. The NCA should draw from social science research on differential vulnerability and resilience, which are directly about observed impacts. An important message could also be about the range of impacts due to a given driver.

The panel also noted that this topic would be a good place to bring in the international aspect – for example, the Michigan cherry festival this year will have cherries imported from Poland (due to crop loss related to early spring warming followed by a freeze in Michigan). There is also an opportunity to address net impacts - e.g., agriculture will be harmed in some places but helped in others. Even if the agricultural sector does relatively well over all, there will be different effects on different farmers due to levels of adaptive capacity and influences from global markets. This is an important point to emphasize.

While it is difficult to include the various scales in a synthesis report, it needs to be considered. One idea for illustrating the various scales and impacts of climate-related events is to highlight a hurricane that has hit the Caribbean and the southern U.S. and compare costs and number of people affected in both locations. Such an analysis would provide an illustration of the impacts in a developed vs undeveloped condition from the same storm. It was noted that an important part of the NRC's review should be how the issues of scale are addressed.

Impacts can be couched in terms that are accessible to people – e.g., the risk over the 30 years of paying off your home mortgage. The NCA will ideally highlight information that will help people understand what they should worry about, and can use indicators and milestone markers that mean things to people. The panel expressed concern about the psychological burden of sharing worrying information, and suggested that the NCA should help people understand how to think about the impacts. Information needs to be given in socially relevant ways, such as stating scales of change that would cause loss of soybean crops and comparing the magnitude to given past events.

To convey the scales of impact in some cases, it is acceptable to say "people are concerned about these issues" rather than "these impacts will happen." It is true that people are concerned about impacts, and the NCA can take concerns seriously and may be able to help with probabilities.

For cascading effects, there are limits to resilience as the magnitude of events expands in scale. Illustrative examples could be included to demonstrate the limits to resilience – perhaps even the recent (June 29, 2012) Mid-Atlantic derecho could be an illustrative story.

Finally, the panel discussed that "surprises" are usually not inexplicable, but are just things that people hadn't previously been thinking about. It could be stated, "the weather has been surprising throughout human experience, but in the new unstable regime, there are likely to be more surprises." From a social perspective, this would be an important thing to say: we may have done a good scientific analysis, but we need to also do a good job of analyzing and preparing for results.

PRODUCT #8 *Specific themes that could be emphasized across the whole report.*

Adaptive or iterative risk management should be pulled out as a framing idea (it is a framing question for the NCA, and has been going well).

The international context deserves a whole chapter. For example, carbon accounting and mitigation should be placed in the international context: the U.S. can shut down emissions but it won't matter unless every the rest of the world also does – and emissions due to imported products need to be accounted for. There are also many other examples of the need for international context.

Focus on the interaction of adaptation and mitigation was suggested, as well as mitigation of risk.

ADDITIONAL COMMENTS

The panel is open to having ongoing engagement, but the current panel is just appointed for the 2013 report (one year term). The next panel meeting will be approximately Dec 13-15, once the draft report is released. The panel would be interested in receiving some updates or background information in the coming months, possibly through a webinar.